

### **REMARKS/ARGUMENTS**

In the Office Action dated November 16, 2006, Claims 1, 2, 4-12, 16-23, and 36-42 are pending. Claims 1, 2, 4, and 10-12 are rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 4,882,823 to Weisert, et al. in view of U.S. Patent No. 3,713,207 ("Ruckle '207"), U.S. Patent No. 4,982,893 ("Ruckle '893"), and WO 95/13406 to Movchan, et al. Claims 5-9 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Weisert, et al. in view of Ruckle '207, Ruckle '893, and Movchan, et al. in further view of U.S. Patent No. 5,118,026 to Stacher. Claims 16-23 and 36-42 are rejected on the same basis, i.e., under 35 U.S.C. § 103(a) as being unpatentable over Weisert, et al. in view of Ruckle '207, Ruckle '893, Movchan, et al., and Stacher. Claim 42 is objected to for an informality.

Claim 42 is amended above. Applicant respectfully requests reconsideration of the claims in light of the amendments and the following remarks.

First, with regard to the objection to Claim 42, the claim is amended above to correct an informality. In particular, Claim 42 is amended to refer to "the blanks" as requested by the Examiner. The Examiner's careful review of the application is noted with appreciation.

Applicant now addresses the rejections under § 103. Claim 1 is directed to a method for superplastically forming blanks to produce a first structural member having a predetermined configuration. The method includes providing first and second blanks that comprise titanium and have a grain size of between 0.8 and 1.2 micron, heating the blanks, diffusion bonding the blanks at less than 1450 °F, and superplastically forming the bonded blanks at less than 1450 °F.

The Office Action acknowledges that Weisert, et al. fails to disclose a number of features of Claim 1, namely, the grain size of the materials of the blanks, a diffusion bonding temperature less than 1450 °F, and a superplastic forming temperature less than 1450 °F. However, the Office Action asserts that it would have been obvious to modify Weisert, et al. in light of Ruckle '207, Ruckle '893, and Movchan, et al. to include these features.

In particular, the Office Action states that "Ruckle '207 generally teaches a superplastic titanium alloy with a grain size of about 1 micron (Ruckle '207, col. 4, lines 46-48 and col. 2, lines 63-67 through col. 3, lines 1-3)" (Office Action, page 3) and that it would have been obvious "to modify the invention of Weisert to include the grain size of typical titanium alloy of

Ruckle '207 in order to provide alloys with the ability to form homogeneous diffusion bonded joints at reduced pressures (Ruckle '207, col. 3, lines 32-34)" (Office Action, page 4).

Applicant respectfully disagrees. Ruckle '207 discloses a process in which "surfaces to be diffusion bonded are positioned in abutment with a sheet of material in a condition of superplasticity sandwiched therebetween." Col. 3, lines 26-29. In other words, a superplastic material is provided between the two surfaces to be joined so that the superplastic material fills voids between the surfaces of the two joined members. *See* col. 3, lines 32-47. Ruckle '207 does not teach or suggest that the two members themselves can be formed of a superplastic material and, in particular, a superplastic material having any particular grain size. Accordingly, even in light of Ruckle '207, it would not have been obvious to form the two contoured sheets of Weisert, et al. of such a material as recited in Claim 1.

Further, the Office Action acknowledges that Weisert, et al. fails to disclose diffusion bonding at a temperature of less than 1450 °F but asserts that "Ruckle '893 discloses diffusion bonding multiple titanium alloy blanks at a temperature of less than 1450°F (Ruckle '893, col. 2, lines 19-23)" (Office Action, page 3) and that it would have been obvious "further to modify the combined invention of Weisert and Ruckle '207 to include the diffusion bonding temperature of Ruckle '893 in order to increase the rate of diffusion so that voids can be eliminated and bonding achieved without excessive pressure or excessive bonding time (Ruckle '893, col. 2, lines 19-23)" (Office Action, page 4).

Applicant again disagrees. Even if Weisert, et al. could fairly be modified in light of Ruckle '207, it would not have been obvious to modify Weisert, et al. further to include the use of the recited diffusion bonding temperature. Indeed, Ruckle '893 does not even teach such a bonding temperature. The portion of Ruckle '893 that is cited in the Office Action in this regard (col. 2, lines 19-23), merely states that "diffusion bonding temperatures are usually selected which range from about the beta transus temperature (about 995° C.) to well below the beta transus temperature (about 870° C.)" In other words, Ruckle '893 merely discloses that the temperature usually selected for diffusion bonding can be as low as 870° C, or 1598° F. Ruckle '893 does not teach diffusion bonding at a temperature of less than 1450° F as set forth in Claim 1.

Further still, although the Office Action acknowledges that Weisert, et al. does not teach superplastically forming at a temperature less than 1450° F, it asserts that this deficiency of Weisert, et al. is cured by Movchan, et al. In particular, the Office Action states that it would have been obvious “to further modify the combined invention of Weisert, Ruckle ‘207, Ruckle ‘893 to include the superplastic formation temperature and strain rates of Movchan in order to superplastically form titanium blanks at temperature where oxidation is not a problem even in ambient atmospheres (Movchan et al., p. 3, lines 24-26).” Office Action, page 4.

Applicant again respectfully disagrees. Movchan, et al. discloses the use of a material that is vapor deposited on a substrate under certain conditions to have a very particular structure, i.e., grains having a short diameter in a plane parallel to the substrate and a long dimension in a plane perpendicular to the substrate, with a specified range of ratios therebetween. According to Movchan, et al., the “deposition process produces grains which meet the requirements for superplasticity in two dimensions, but not in a third dimension.” See pages 6-7. Given the stated importance of the structure and the sensitivity to variations in the process, it would not have been obvious to modify the superplastic forming operation of the contrary materials of Weisert, et al. to conform to the process discussed by Movchan, et al. Further, even if the materials of Weisert, et al. could have been modified to conform to the specifications discussed by Movchan, et al., the materials would not have the refined grain structure of Claim 1, but would instead be characterized by grains having a long dimension such that the requirements for superplasticity would not be met in the third dimension.

For each of these reasons, Applicant submits that Ruckle ‘207, Ruckle ‘893, and Movchan, et al. cannot fairly be combined with Weisert, et al. in the manner set forth in the Office Action, and the deficiencies of Weisert, et al. are not cured by the other references. Accordingly, Applicant submits that Claim 1 is allowable over these references, as are each of the dependent Claims 2 and 4-12.

Further, the dependent claims provide additional bases of distinction over the cited references. For example, Claim 10 recites “superplastically forming the structural member at a temperature between 1400 °F and 1450 °F.” The Office Action does not allege that any of the cited references disclose this feature. Claim 11 recites “superplastically forming the blanks at a

strain rate of at least about  $6 \times 10^{-4}$  per second” and Claim 12 recites “a strain rate of at least about  $1 \times 10^{-3}$  per second.” The Office Action states that “the properties and method of invention are so similar with that of the applicant’s claimed invention it is necessarily present to arrive at the specified strain rates of claims 11 and 12.” Office Action, page 3. Applicant disagrees. The specified strain rates are neither disclosed by, nor inherent in, the process of Weisert, et al. Moreover, given the differences in the material properties of conventional materials and the materials described by the present invention, it is not even clear that the process of Weisert, et al. could be performed at the specified strain rates. Further, with regard to the strain rates discussed in Movchan, et al., Applicant again notes the dissimilarities of the material disclosed by Movchan, et al. and the materials of the other cited references. In light of these differences, it would not have been obvious to apply the strain rates disclosed by Movchan, et al. to the different materials disclosed by Weisert, et al. In addition, even if the process of Weisert, et al. could be performed at the recited strain rates, the references do not provide any motivation for modifying the strain rates of Weisert, et al. In this regard, the Office Action states that the modification would have been obvious “to superplastically form titanium blanks at temperatures where oxidation is not a problem even in ambient atmospheres” but does not indicate how the modification to the strain rate effects this purpose. Further, Weisert, et al. teaches away from such a modification by pointing to the avoidance of excessive strain rates as preventing rupturing of the structure. See col. 5, lines 39-43.

Claim 6, which stands rejected under § 103(a) as being unpatentable over Weisert, et al. in view of Ruckle ’207, Ruckle ’893, Movchan, et al., and Stacher, additionally recites “pickling the structural member to remove alpha case oxide formed thereon during said superplastically forming step.” Thus, the claim requires that the pickling is performed after the superplastically forming step, i.e., to remove alpha case oxide formed during the superplastic forming. The Office Action, in this regard, notes that Weisert, et al., even when combined with Ruckle ’207, Ruckle ’893, and Movchan, et al., lacks disclosure of such a pickling step. However, the Office Action asserts that “Stacher further teaches that the surfaces require preparatory cleaning (i.e. pickling) (Stacher, col. 2, lines 45-47) and states that further application of pressure breaks up the surface oxides to present clean surfaces for bonding (Stacher, col. 2, lines 53-55).” Office

Action, page 5. The Office Action does not even assert that Stacher discloses pickling a structural member to remove alpha case oxide formed thereon during a superplastically forming step, as recited in Claim 6.

Further, the only supposed motivation noted in the Office Action for further modifying the combination of Weisert, et al., Ruckle '207, Ruckle '893, and Movchan, et al. in light of Stacher concerns "preparatory cleaning" (which the Office Action asserts to be pickling). That is, regarding Claim 6, the Office Action states that it would have been obvious "to modify the combined invention of Weisert[,] Ruckle '207, Ruckle '893, and Movchan to include the pickling step of Stacher in order to significantly lower the cost, difficulty, and time involved in diffusion bonding and superplastic forming titanium alloy structures (Stacher, col. 3, lines 30-36)." Office Action, pages 5-6. However, as noted above, Claim 6 requires pickling after the superplastic forming step to remove alpha case oxide formed during superplastically forming. The references do not teach or suggest this feature of Claim 6, and a person of ordinary skill in the art would not have been motivated to perform the claimed pickling step in order to affect a diffusion bonding operation that occurs prior thereto. Indeed, it is unclear how pickling the formed part of Weisert, et al. after superplastic forming (as recited in Claim 6) would address the supposed motivation of Stacher for lowering the cost, difficulty, and time involved in the previously performed diffusion bonding and superplastic forming operations.

Claims 7-9 depend from Claim 6. In addition to the above distinctions, Claims 7-9 provide further features that are not taught or suggested by the cited references. Further, the Office Action does not refer to any reference as teaching these features but simply asserts that the claims are obvious. For example, Claim 7 recites that the pickling step "comprises subjecting the structural member to a pickling fluid and thereby removing material from surfaces of the structural member at a rate less than about  $5 \times 10^{-5}$  inch per minute." The Office Action does not refer to the use of a pickling fluid in the cited references and does not refer to any such rate of material removal in the cited references. Instead, the Office Action states that "with the combined invention of Weisert, Ruckle '207, Ruckle '893, Movchan, and Stacher it is obvious to arrive at the claimed pickling rate." Given that only Stacher refers to preparatory cleaning and under different conditions than the present invention, it is unclear on what basis in the prior art

the rejection is made. Similarly, Claim 8 recites the removal of "less than about 0.001 inch from each surface of the structural member." The Office Action does not refer to any such teaching in the prior art but simply states that "with the combined invention of Weisert, Ruckle '207, Ruckle '893, Movchan, and Stacher it is obvious to arrive at the claimed amount of oxide to be removed from the surfaces."

Independent Claims 16 and 36 (and the claims depending therefrom) stand rejected under § 103(a) as being unpatentable over Weisert, et al. in view of Ruckle '207, Ruckle '893, Movchan, et al., and Stacher. Claims 16 and 36 include features similar to those discussed above. Therefore, each of Claims 16-23 and 36-42 are therefore asserted to be patentable over the cited references for the reasons described above.

Accordingly, Applicant respectfully submits that each of the pending Claims 1, 2, 4-12, 16-23, and 36-42 is patentable over the cited references.

\* \* \* \*

### **CONCLUSION**

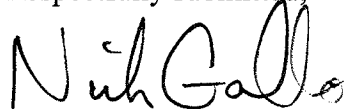
In view of the claim amendments presented above, Applicant submits that the present application is in condition for allowance. As such, the issuance of a Notice of Allowance is therefore respectfully requested. In order to expedite the examination of the present application, the Examiner is encouraged to contact Applicant's undersigned attorney in order to resolve any remaining issues.

It is not believed that extensions of time or fees for net addition of claims are required, beyond those that may otherwise be provided for in documents accompanying this paper. However, in the event that additional extensions of time are necessary to allow consideration of this paper, such extensions are hereby petitioned under 37 CFR § 1.136(a), and any fee required

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therefore (including fees for net addition of claims) is hereby authorized to be charged to Deposit Account No. 16-0605.

Respectfully submitted,

A handwritten signature in black ink, appearing to read "Nich Gallo", with a stylized flourish at the end.

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